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2-13-2007

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Recommended Citation

Potier, Beth, "Making Operating Rooms Safer With Open Communication Among Equipment" (2007). *UNH Today*. 645.
<https://scholars.unh.edu/news/645>

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Making Operating Rooms Safer With Open Communication Among Equipment

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February 13, 2007

DURHAM, N.H. -- New research at the University of New Hampshire aims to make hospital operating rooms safer by opening the lines of communication between computerized hospital beds and blood pressure monitors.

"We're trying to get pieces of equipment that don't normally talk to each other to do so," says John LaCourse, professor of electrical and computer engineering at UNH. "We're doing something that we feel is going to save peoples' lives."

In modern operating rooms, major pieces of equipment like beds and monitors are computerized, yet they lack the ability to share information with each other. When a bed is raised or lowered, for instance, a patient's blood pressure fluctuates but the monitor, which is static, may give a faulty reading. "Can we have some kind of control in this existing environment? Absolutely," says LaCourse, noting that operating room personnel can mentally calculate a more accurate reading. "But we want double-fault controls because there are peoples' lives at stake. Our primary objective is to reduce the 98,000 annual death rate caused by medical errors." LaCourse notes that miscommunication between operating room instruments may be a cause of these errors.

LaCourse is principal investigator on the project, working in conjunction with Bedford company IXXAT, Inc. and Massachusetts General Hospital in Boston, where it is part of a larger initiative called Operating Room of the Future. Two of LaCourse's students, senior Jeff Ojala and master's student Jonathan Waters, are leading most elements of the investigation. The team is looking to calibrate the invasive blood pressure monitor based on changes to a patient's elevation and angle as the surgical bed changes position.

The researchers are exploring the use of CANopen, a communications protocol that uses a common hardware and software packages while maintaining the integrity of the proprietary electronics of each element. It's been used in the automotive industry for many years, creating interfaces between the various computerized elements of cars that are manufactured separately. In the ultra-competitive environment of medical devices, however, CANopen has not been installed.

"The most challenging part of this project has been trying to get information from the manufacturers, who are trying to protect their rights," says LaCourse. In his lab, two medical beds from competing manufacturers sit side-by-side; the researchers must carefully guard operating information that's unique to each of them. "We don't want to infiltrate their privacy or their patent privilege," he says.

Ojala and Waters are now moving their research into what LaCourse calls "closing the loop." If they want the patient's blood pressure to stay steady, at say 140 over 90, can they program the bed to automatically rise and fall to maintain that blood pressure? "We're trying to see if we can not only get the bed and the monitor to talk to each other but also control each other," says LaCourse.

Ultimately, LaCourse hopes to demonstrate that this “plug-and-play” technology can be adopted by all electronic instruments in operating rooms: Beds and blood pressure monitors as well as ventilation systems, ultrasound monitors, and electrocardiogram monitors will have CANopen software installed by the manufacturers. Doctors and medical personnel will simply push certain buttons for certain procedures instead of manually or mentally calibrating the instruments to each other as they now must do.

And as the aging population brings more computerized medical equipment into homes and other less formal caregiving settings, such interoperability will become even more crucial. “Doctors and other medical professionals don’t have the time to help these instruments communicate with each other. They have more important things to do,” says LaCourse.

For more information on this project, go to <http://www.ece.unh.edu/biolab/hof/>.